

## Technology in the ELA Standards

### Summary Points

- Standards where technology is specifically addressed begin in writing grade 3.
- Keyboarding skills are addressed in the standards beginning in grade 3.
- Technology is specifically addressed in the writing standards (Standard 6 & 8). However, the writing standards are closely tied to the reading standards and are meant to work in tandem with the reading standards for information and for literature.
- The standards provide an expectation that students will use technology to interpret information from a variety of sources, including web pages, beginning in grade 4.
- The standards below address technology directly in the wording.

Grade	Standard	Standard Wording
3	Writing W.3.6	With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others and to locate information about topics.
3	Writing W.3.8	Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
4	Writing W.4.6	With some guidance and support from adults, use technology, including the Internet, to produce, edit, and publish writing as well as to interact and collaborate with others and to locate information about topics; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.
4	Writing W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
4	Reading (I) RI.4.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
5	Writing W.5.6	With some guidance and support from adults, use technology, including the Internet, to produce, edit, and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.
5	Writing W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
5	Reading (I) RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
6	Writing W.6.6	Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to create a piece of writing.

6	Writing W.6.8	Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
6	Reading (I) RI.6.7	Integrate information presented in different media (e.g., may include, but not limited to podcasts) or formats (e.g., visually, quantitatively/ data-related) as well as in words to develop a coherent understanding of a topic or issue.
7	Writing W.7.6	Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.
7	Writing W.7.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
7	Reading (I) RI.7.7	Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the method of the delivery of a speech affects the impact of the overall message).
8	Writing W.8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.
8	Writing W.8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
8	Reading (I) RI.8.7	Evaluate the advantages and disadvantages of using different media (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
9-10	Writing W.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
9-10	Writing W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9-10	Reading (I) RI.9-10.7	Analyze various accounts of a subject told in different media (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
11-12	Writing W.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

11-12	Writing W.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
11-12	Reading (I) RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.

<p>Summary</p> <ul style="list-style-type: none"> <li>The Speaking and Listening standards guide students to progress in their ability to use multimedia to present information. Presentation in grades 9-12 will incorporate strategic use of digital media in order to add interest and enhance audience understanding.</li> </ul>				
SL.6.5 Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.	SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.	SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

<b>Standards for Literacy in the Content Areas</b>		
Grade	Standard	Standard Wording
6-7-8	Reading History RH.6-7-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
6-7-8	Writing WHST.6-7-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
6-7-8	Writing WHST.6-7-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
9-10	Reading History/SS/Sci RH.9-10.	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital texts.
9-10	Writing WHST.9-10.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
9-10	Writing WHST.9-10.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
11-12	Reading History RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital texts.
11-12	Writing WHST.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
11-12	Writing WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

## Technology in the Mathematics Standards

### Summary Points

- Mathematical Practices outline the use of technology starting in kindergarten
  - Mathematical Practices provide the problem solving processes that are necessary and used in conjunction with the content standards.
  - Mathematical Practice 5 references the use of technology as a tool.
- Content standards that specifically require technology begin in grade 7.
- The use of “available technology” allows teachers to use a variety of technology sources to supplement their instruction.
- The standards below reference the use of technology (calculators, spreadsheets, etc.) directly in the standards.

Grade	Mathematical Practice	Standard Wording
	1	<i>Make sense of problems and persevere in solving them.</i> <ul style="list-style-type: none"> <li>• They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need.</li> </ul>
	5	<i>Use appropriate tools strategically.</i>
K-2		Mathematically proficient students will select the available tools (such as pencil and paper, manipulatives, rulers, and available technology) when solving a mathematical problem.
3-5		Mathematically proficient students will: <ul style="list-style-type: none"> <li>• select the available tools (such as pencil and paper, manipulatives, rulers, calculators, a spreadsheet, and available technology) when solving a mathematical problem</li> <li>• know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data</li> </ul>
6-8		Mathematically proficient students will: <ul style="list-style-type: none"> <li>• represent and compare possibilities visually with technology when solving a problem</li> <li>• select and use tools appropriate to the task: pencil and paper, protractor, visual and physical fraction models, algebra tiles, geometric models, calculator, spreadsheet, and interactive geometry software</li> </ul>

9-12		<p>Mathematically proficient students will:</p> <ul style="list-style-type: none"> <li>select and accurately use appropriate, available tools (such as pencil and paper, concrete or virtual manipulatives such as geoboards and algebra tiles, graphing and simpler calculators, a spreadsheet, and available technology) when solving a mathematical problem</li> <li>use technology to visualize the results of varying assumptions, exploring consequences, comparing predictions with data, and deepening understanding of concepts</li> </ul>
Grade	Standard	Standard Wording
7	7.G.2	Draw (freehand, with ruler and protractor, and with technology) geometric shapes including polygons and circles with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
8	8.EE.4	Perform operations with numbers expressed in scientific notation, including problems where both standard notation and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.
8	8.G Heading	Understand congruence and similarity using physical models, transparencies, or geometry software.
HS	A.REI.9	(+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension $3 \times 3$ or greater).
HS	A.REI.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
HS	F.IF.7	<p>Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p>a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.</p> <p>b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as <math>y = (1.02)^t</math>, <math>y = (0.97)^t</math>, <math>y = (1.01)^{12t}</math>, <math>y = (1.2)^{t/10}</math>, and classify them as representing exponential growth or decay</p>
HS	F.BF.3	(+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$ , $\pi/4$ and $\pi/6$ , and use the unit circle to express the values of sine, cosines, and tangent for $\pi - x$ , $\pi + x$ , and $2\pi - x$ in terms of their values for $x$ , where $x$ is any real number.

HS	F.LE.4	(+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
HS	F.TF.7	(+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.*
HS	G.CO.2	Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).
HS	G.CO.5	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.
HS	G.CO.12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
HS	S.ID.4	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
<b>Narrative of Standards</b>		
HS	S.ID.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
HS	Modeling	<ul style="list-style-type: none"> <li>The range of models that we can create and analyze is also constrained by the limitations of our mathematical, statistical, and technical skills, and our ability to recognize significant variables and relationships among them. Diagrams of various kinds, spreadsheets and other technology, and algebra are powerful tools for understanding and solving problems drawn from different types of real-world situations.</li> <li>Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.</li> </ul>
HS	Numbers and Number Systems	<ul style="list-style-type: none"> <li>Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.</li> </ul>

HS	Algebra	<ul style="list-style-type: none"> <li>• A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.</li> </ul>
HS	Functions	<ul style="list-style-type: none"> <li>• Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.</li> </ul>

(+) Content Standards that include additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics or discrete mathematics.

Asterisk (\*) Content standards and Standards for Mathematical Practice that focus on mathematical modeling.